

CLAIMS

We claim:

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1. An article of apparel comprising an insulating component incorporated into the article of apparel, wherein the improvement comprises an insulating component comprising an insulating structure comprising a) a gas impermeable envelope and b) a porous material contained within the envelope, wherein the insulating structure has a thermal conductivity of less than or equal to 25mW/m K at 25°C.

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2. The article of apparel of claim 1, wherein apparel comprises headwear, footwear or handwear.

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3. The article of apparel of claim 1, wherein apparel comprises a boot.

4. The article of apparel of claim 1, wherein the insulating structure has a thickness of 10 mm or less.

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5. The article of apparel of claim 1, wherein the insulating structure has a thickness of 3 mm or less.

6. The article of apparel of claim 1, wherein the insulating structure has a thermal conductivity less than 20 mW/m K.

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7. The article of apparel of claim 1, wherein the insulating structure has a thermal conductivity between about 15-18 mW/m K.

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8. The article of apparel of claim 1, wherein the envelope is at least partially evacuated.

9. The article of apparel of claim 1, wherein the porous material has a pore size of 100 nm or less.

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10. The article of apparel of claim 1, wherein the porous material has a pore size of 20nm or less.

11. The article of apparel of claim 1, wherein the porous material is selected from metal oxides.
- 5 12. The article of apparel of claim 1, wherein the porous material is fumed silica.
13. The article of apparel of claim 1, wherein the porous material is an aerogel.
- 10 14. The article of apparel of claim 13, wherein the aerogel comprises silica.
15. The article of apparel of claim 1, wherein the insulating structure further comprises a binder.
- 15 16. The article of apparel of claim 1, wherein the insulating structure further comprises carbon or titanium dioxide.
17. The article of apparel of claim 1, wherein the envelope comprises a gas having a molecular weight greater than that of air.
- 20 18. A method of forming an insulated apparel article comprising providing an insulating component; and incorporating an insulating component into the article of apparel, wherein the insulating component comprises an insulating structure comprising a) a gas impermeable envelope and b) a porous material contained within the envelope, wherein the insulating structure has a thermal conductivity of less than or equal to 25 mW/m K at about 25°C.
- 25 19. The method of claim 18, wherein the insulated apparel article has inner and outer textile layers and the method further comprises incorporating the insulating component between the inner and outer layers.
- 30 20. The method of claim 18, wherein the insulated apparel article has inner and outer textile layers and the method further comprises affixing the insulating component to the inner textile layer.
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21. The method of claim 18, wherein the insulated apparel article has inner and outer textile layers and the method further comprises affixing the insulating component to the outer textile layer.
- 5 22. A method of increasing the thermal insulation value of an article of apparel without substantially changing the fit of the article comprising providing an article of apparel, providing a insulating component comprising a gas permeable envelope and a porous material contained within the envelope, wherein the insulating structure has a thickness of
10 about 3mm or less and comprises a thermal conductivity of less than or equal to 25 mW/m K at 25°C, and incorporating the insulating component into the article of apparel.
- 15 23. The method of claim 22, wherein the article of apparel has a thermal insulation value of about 0.3 to 1.7 m²K/W.
24. The method of claim 22, wherein the insulating structure has a thickness of about 2mm or less.
- 20 25. A method of insulating a person from environmental conditions comprising providing an insulated article of apparel, and positioning the insulated article of apparel between the environment and the person, wherein the insulated article of apparel comprises an insulating component comprising an insulating structure having a) a gas
25 impermeable material and b) a porous material contained within the envelope, the insulating structure having a thermal conductivity of less than or equal to 25 mW/m K at 25°C.
- 30 26. The method of claim 25, wherein the environment is a low temperature environment.
- 35 27. A method of insulating a boot comprising providing a boot having a toe cap area, a boot upper and a boot sole, and providing an insulating component comprising a) a gas impermeable envelope and b) a porous material contained within the envelope, and the insulating structure has a thermal conductivity of less than or equal to 25

mW/m K at 25°C, to at least one of the toe cap area, the boot upper and the boot sole.

28. The method of claim 27, wherein the boot comprises inner and outer
5 boot layers and the insulating component is positioned between the
layers.
29. The method of claim 27, wherein the insulating component is affixed to
10 the inner layer and adjacent to a wearer of the boot.